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Three New Eosentomid Species (Protura, Eosentomidae) from Yunnan, Southwest China¹⁾

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Abstract Two new species of the genus *Eosentomon* and a new species of the genus *Pseudaisentomon* are described from Yunnan, Southwest China. They are *E. daliense*, *E. ailaoense* and *P. cangshanense*.

Key words: Protura; new species; *Pseudaisentomon*; *Eosentomon*; Yunnan.

Through the soil faunistic surveys made by our Sino-Japanese joint party in Yunnan for 1992 and 1993, many proturan specimens have been obtained from various places. Our preliminary examination revealed that many unknown forms were to be found in our collection. In the present paper, we are going to describe three new eosentomid species as the second part of the series dealing with the results of our investigations on the proturan fauna of Yunnan. The type specimens designated in the present paper will be deposited in the collection of the Shanghai Institute of Entomology, Academia Sinica, China.

We wish to express our hearty thanks to Dr. Shun-Ichi UÉNO, Messrs. CHENG Yi-cun, XIAO Ning-nian, ZHANG Jun and all who favoured us with every kind of help through our cooperative works.

Eosentomon daliense sp. nov.

(Figs. 1–2)

Specimens examined. 1♂, 1♀ and 1 larva I, Mt. Laotai Shan, 1,810 m alt., Binchuan, Yunnan, 30–VIII–1993, collected by XIAO Ning-nian; 2♂, 2♀, 1 matus junior and 1 larva I, Mt. Xiaojin Shan, 2,140 m alt., Dali, Yunnan, 3–IX–1993, collected by XIE Rong-dong and others; 10♂, 17♀, 2 larva II and 7 larva I, ditto, 2,200 m alt., 3–IX–1993, collected by XIAO Ning-nian and

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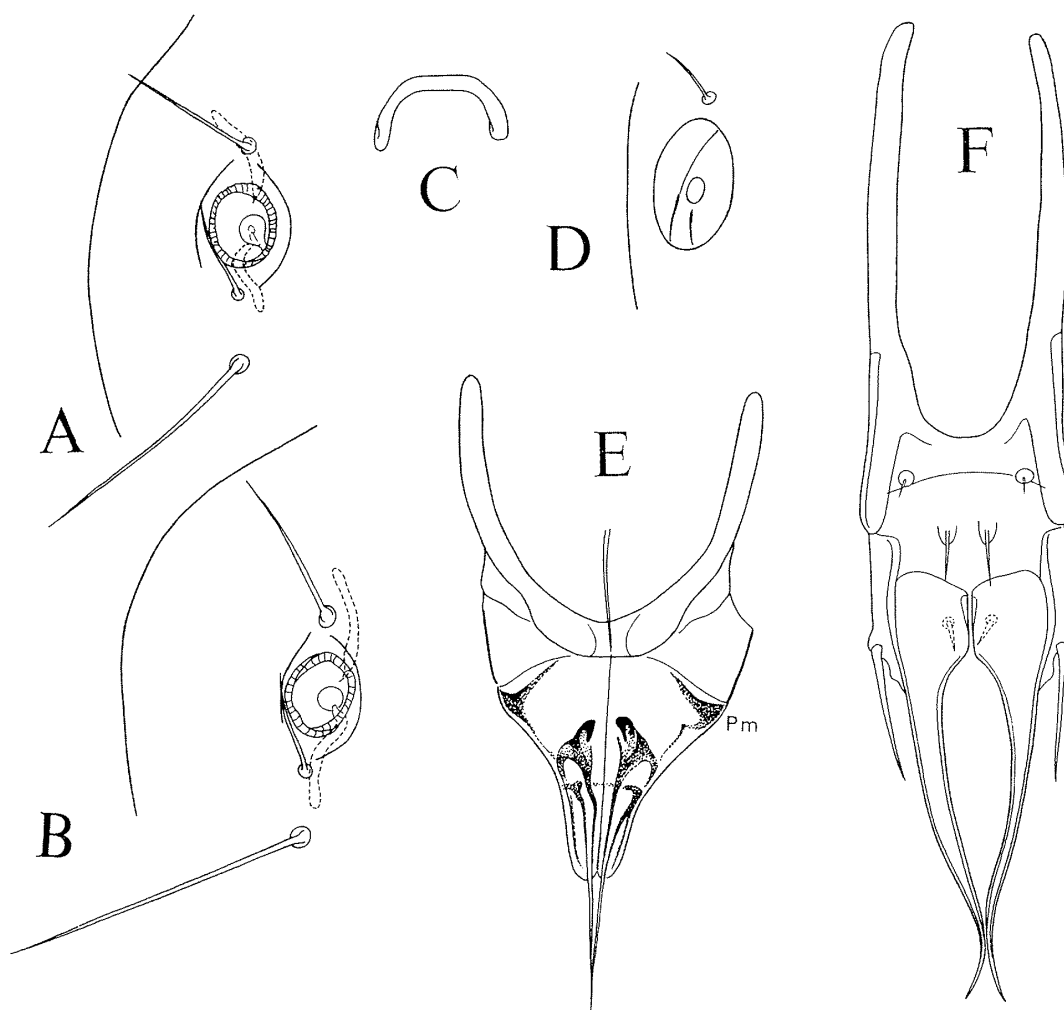


Fig. 1. *Eosentomon daliense* sp. nov. A, Spiracle, thorax II; B, same, thorax III; C, clypeal apodeme; D, pseudoculus; E, female squama genitalis; F, male squama genitalis. Sign: Pm, proximo-lateral sclerotization.

others.

Body length 930–1,040 μm .

Head oval, 126–138 μm in dorsal view. Anterior and posterior additional setae present; subposterior setae about twice the posterior in length; anterior sensilla absent, but the posterior is present. Labral setae present; rostral setae with basal dilatation, a little shorter than the subrostral; clypeal apodeme distinct (Fig. 1C). Maxillary palpus with two sensillae, dorsal sensilla a little longer than the lateral. Pseudoculus ovid, with a long median and a short lateral striae and one globule (Fig. 1D), PR=10.

Tracheal camerae slender (Fig. 1A–B). Foretarsus (Fig. 2) 94–102 μm (90 μm in matus junior, 80–81 μm in larva II, 72–77 μm in larva I), TR=4.9–5.0; empodium subequal to the claw in length; S-shaped seta a little shorter

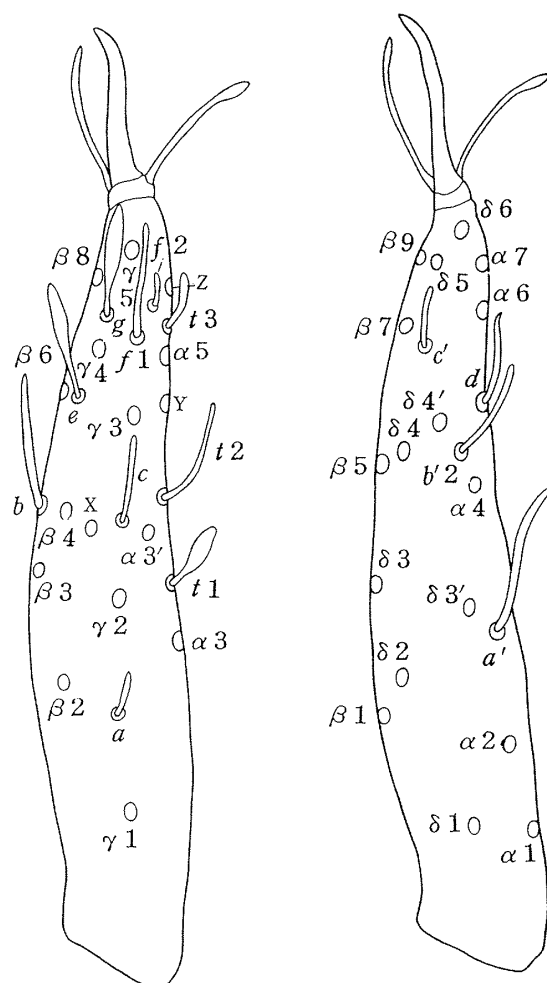


Fig. 2. *Eosentomon daliense* sp. nov. Foretarsus, exterior (left) and interior (right) views.

than the claw. Dorsal sensilla *t1* about halfway between $\alpha 3$ and $\alpha 3'$, BS = 1.1–1.2; *t2* thin; *t3* normal. Exterior sensilla *a* short, its apex slightly surpassing the level of $\beta 2$; the apex of *d* reaching the base of $\alpha 6$; *e* and *g* spatulate; *f1* relatively long, its apex surpassing the base of $\gamma 5$; *f2* very short. Interior sensilla *a'* situated at the same level as $\alpha 3$; *b'1* absent; *b'2* subequal to *d* in length; *c'* short, its apex not reaching the base of $\delta 5$. Middle tarsus 48–52 μm ; its claw 15–16 μm ; empodium very short, less than one-ninth the claw in length. Hind tarsus 61–63 μm ; its claw 16–17 μm ; empodium very short, less than one-ninth the claws in length.

Chaetotaxy as shown in Table 1. On thoraces II–III, dorsal P1a situated on the same row as P1 and 2, sensilla-like and very short, less than one-third of P1. Abdominal tergites II–IV with five pairs of anterior setae; terg. V with three pairs, A2, 4 and 5; terg. VI–VII with two pairs, A4 and 5; terg. IX–XI with four pairs of tergal setae; sternite VIII with seven posterior setae, without anterior seta; stern. IX–X each with four sternal setae, 1 and 2, without 1a. On terg. I,

Table 1. Chaetotaxy of *Eosentomon daliense* sp. nov.*

		Dorsal		Ventral	
		Formula	Composition of setae	Formula	Composition of setae
Thorax	I	4		$\frac{6-2}{4}$	A1, 2, 3, M P1, 2
	II	$\frac{6}{18}$	A2, 4, M P1, 1a, 2, 2a, 3, 3a, 4, 5, 5a	$\frac{6-2}{6}$	A1, 2, 3, M P1, 2, 3
	III	$\frac{6}{18}$	A2, 4, M P1, 1a, 2, 2a, 3, 3a, 4, 5, 5a	$\frac{6-4}{8}$	A1, 2, 3, M1, 2 P1, 2, 3, 4
Abdomen	I	$\frac{4}{12}$	A1, 2 P1, 1a, 2, 2a, 3, 4	$\frac{4}{4}$	A1, 2 P1, 2
	II-III	$\frac{10}{16}$	A1, 2, 3, 4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{4}$	A1, 2, 3 P1, 2
	IV	$\frac{10}{16}$	A1, 2, 3, 4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{10}$	A1, 2, 3 P1, 2, 2a, 2a', 3
	V	$\frac{6}{16}$	A2, 4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{10}$	A1, 2, 3 P1, 2, 2a, 2a', 3
	VI-VII	$\frac{4}{16}$	A4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{10}$	A1, 2, 3 P1, 2, 2a, 2a', 3
	VIII	$\frac{6}{9}$	M2, 4, 5 Pc, 1a, 1a', 2, 2a	$\frac{0}{7}$	Pc, 1, 1a, 2
	IX-X	8	1, 2, 3, 4	4	1, 2
	XI	8	1, 2, 3, 4	8	
	XII	9		12	

* Notation of body setae is referred to that in IMADATÉ (1994).

P1a situated somewhat posterior to the row of P1 and 2, hair-like and a little longer than P1, P3 sensilla-like and very short, P4 rudimentary. On terg. II-V, P1a and 2a situated somewhat posterior to P1 and 2, hair-like and subequal to P1 or P2 in length. On terg. VI-VII, P1a situated on the same row as P1 and 2, sensilla-like and short, less than one-seventh of P1 in length, P2a situated somewhat posterior to the row of P1 and 2, hair-like and more than a half of P2 in length. On terg. VIII, P1a' without basal dilatation, in normal position. Lateral stigmata II-VI distinct, with no reticulation. Lateral sclerotization on stern. VIII distinct.

On female squama genitalis, caput processus roundly bent against the middle line like crane head, with oblique appendices, filum processus relatively long, proximolateral sclerotization well developed (Fig. 1E). Male squama genitalis normal (Fig. 1F).

Holotype. 1 ♀, Mt. Xiaojin Shan, 2,200 m alt., Dali, Yunnan, 3-IX-1993, collected by XIAO Ning-nian and others.

Notes. The present form is characterized by the shape of the caput

processus of female squama genitalis and by the composition of foretarsal sensillae. It is therefore closely similar to *E. yunnanicum* from Yunnan (YIN, 1982, 1985) and Tibet (YIN, 1987, 1988) in China, but is discriminated from the latter by the presence of developed proximolateral sclerotization in the female squama genitalis and by the chaetotaxy of abdominal tergites II–VII.

The following examples of abnormality in chaetotaxy are found. One of A2 on abdominal tergite VI is found in one male and four females from Mt. Xiaojin Shan. A2 on terg. V is lacking in one male and one female from Mt. Laotai Shan. In another female from Mt. Xiaojin Shan, one of P1a on terg. V is situated on the same row as P1 and 2, sensilla-like and very short as that in terg. VI–VII.

The specific name is devied from Dali.

Eosentomon ailaoense sp. nov.

(Fig. 3)

Specimens examined. 3 ♀, Mt. Ailao Shan, 2,662.6 m alt., Jingdong, Yunnan, 28–III–1993, collected by XIAO Ning-nian and others; 1 ♂, 3 ♀, 1 matus junior and 1 larva II, ditto, 2,450 m alt., 28–III–1993, collected by XIE

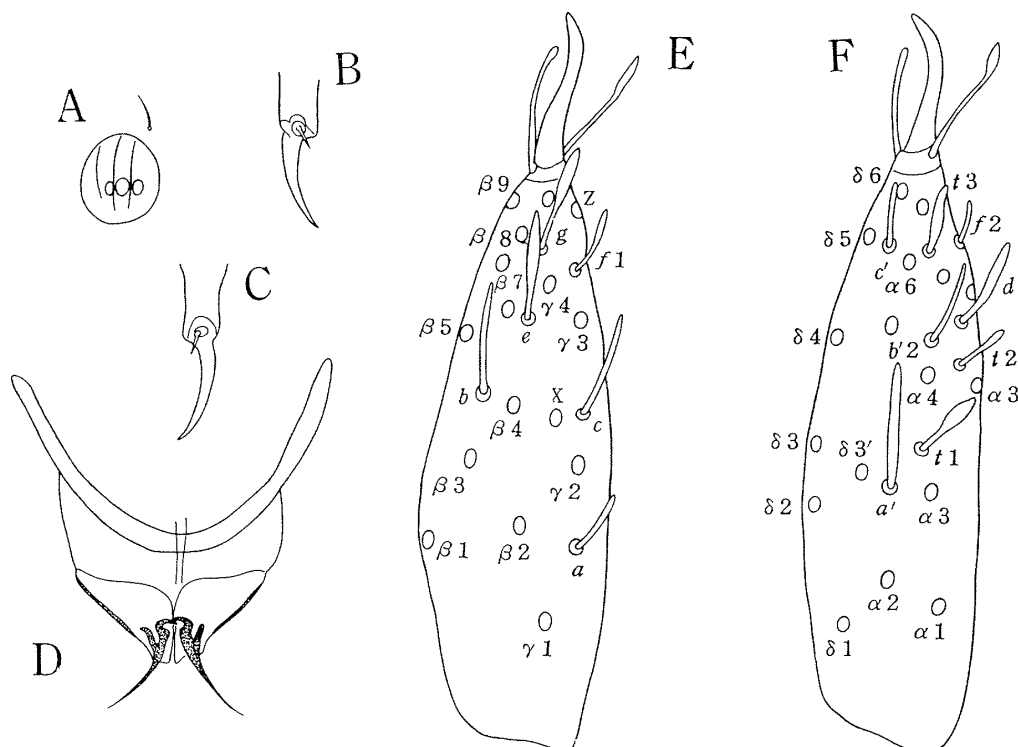


Fig. 3. *Eosentomon ailaoense* sp. nov. A, Pseudoculus; B, middle claw; C, hind claw; D, female squama genitalis; E, foretarsus, exterior view; F, same, interior view.

Rong-dong and others.

Body length 975–1,040 μm .

Head oval, 100–107 μm in dorsal view. Anterior and posterior additional setae present; subposterior setae about 1.3 times the posterior setae in length; anterior and posterior sensillae present. Labral setae present; rostral and subrostral setae with basal dilatation, the rostral a little shorter than the subrostral. Maxillary palpus with two sensillae, lateral sensilla a little longer than the dorsal. Pseudoculus circular with three striae and three globules (Fig. 3A), PR=10.

Tracheal camerae slender. Foretarsus (Fig. 3E–F) 72–75 μm (71 μm in matus junior), TR=4.2; empodium a little shorter than the claw; S-shaped seta subequal to the empodium in length. Dorsal sensilla *t1* close to $\alpha 3$, BS=1.0–1.1; *t2* relatively short; *t3* broad. Exterior sensilla *a* of medium size; *d* broad; *e* and *g* spatulate; *f1* somewhat broad distally; *f2* short. Interior sensilla *a'* situated at the same level as $\alpha 3$, somewhat broad, with its apex reaching the base of $\alpha 4$; *b'1* absent; *b'2* thin; apex of *c'* slightly surpassing the base of $\delta 6$. Middle and hind tarsi with short empodia less than one-ninth their claw in length, respectively (Fig. 3A–C).

Chaetotaxy as shown in Table 2. On thoraces II–III, dorsal P1a situated somewhat posterior to the row of P1 and 2, seta-like and a little shorter than P1, P2a on the same row as P2 and 3, less than a half of P2 in length. Abdominal tergites II–IV with five pairs of anterior setae; terg. V–VI with four pairs, A1, 2, 4 and 5; terg. VII with three pairs, A2, 4 and 5; terg. IX–XI with four pairs of tergal setae; sternite VIII with seven posterior setae, without anterior seta; setrn. IX–X each with four sternal setae, 1 and 2, without 1a. On terg. I, P1a slightly posterior to the row of P1 and 2, hair-like and a little longer than P1, P3 and 4 sensilla-like and very short. On terg. II–VI, P1a and 2a situated somewhat posterior to the row of P1 and 2, hair-like and little shorter than P1. On terg. VII, P1a and 2a situated somewhat posterior to the row of P1 and 2, P1a sensilla-like and very short, less than one-fifth of P1 in length, P2a hair-like and less than two-thirds of P2 in length. On terg. VIII, P1a' with basal dilatation, in normal position. Lateral stigmata on terg. II–IV distinct, with no reticulation. Lateral sclerotization on sternite VIII distinct.

On female squama genitalis, caput processus shaped like duck's head, with oblique appendices, filum processus of medium length, lateral sclerotization distinct.

Holotype. 1 ♀, Mt. Ailao Shan, 2,662.6 m alt., Jingdong, Yunnan, 28–III–1993, collected by XIAO Ning-nian and others.

Notes. This new species is related to *E. yilingense* from Guangxi (YIN & ZHANG, 1982) and Hunan (YIN, 1992) Provinces in China. It is, however, distinguishable from the latter by the short empodium of hind tarsus and by the

Table 2. Chaetotaxy of *Eosentomon ailaoense* sp. nov.

		Dorsal		Ventral	
		Formula	Composition of setae	Formula	Composition of setae
Thorax	I	4		$\frac{6-2}{4}$	A1, 2, 3, M P1, 2
	II	$\frac{6}{18}$	A2, 4, M P1, 1a, 2, 2a, 3, 3a, 4, 5, 5a	$\frac{6-2}{6}$	A1, 2, 3, M P1, 2, 3
	III	$\frac{6}{18}$	A2, 4, M P1, 1a, 2, 2a, 3, 3a, 4, 5, 5a	$\frac{6-4}{8}$	A1, 2, 3, M1, 2 P1, 2, 3, 4
Abdomen	I	$\frac{4}{12}$	A1, 2 P1, 1a, 2, 2a, 3, 4	$\frac{4}{4}$	A1, 2 P1, 2
	II-III	$\frac{10}{16}$	A1, 2, 3, 4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{4}$	A1, 2, 3 P1, 2
	IV	$\frac{10}{16}$	A1, 2, 3, 4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{10}$	A1, 2, 3 P1, 2, 2a, 2a', 3
	V-VI	$\frac{8}{16}$	A1, 2, 4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{10}$	A1, 2, 3 P1, 2, 2a, 2a', 3
	VII	$\frac{6}{16}$	A2, 4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{10}$	A1, 2, 3 P1, 2, 2a, 2a', 3
	VIII	$\frac{6}{9}$	M2, 4, 5 Pc, 1a, 1a', 2, 2a	$\frac{0}{7}$	Pc, 1, 1a, 2
	IX-X	8	1, 2, 3, 4	4	1, 2
	XI	8	1, 2, 3, 4	8	
	XII	9		12	

chaetotaxy of abdominal tergite VII as well as by the structure of pseudoculus.

The specific name is derived from Mt. Ailao Shan, the type locality.

Pseudanisentomon cangshanense sp. nov.

(Fig. 4)

Specimens examined. 2♂, 2♀, Mt. Jizu Shan, 2,300 m alt., Binchuan, Yunnan, 24-III-1993, collected by XIAO Ning-nian and others; 1♀, Jizhaoan, 2,310 m alt., Diancang Shan Mts., Dali, Yunnan, 26-III-1993, collected by XIE Rong-dong and others; 1♂, 1♀, ditto, 31-VIII-1993, collected by YIN Wen-ying and others; 2♀, Xiaojin Shan, 2,200 m alt., Diancang Shan Mts., Dali, Yunnan, 3-IX-1993, collected by XIE Rong-dong and others; 1 matus junior, ditto, 2,250 m alt., 3-IX-1993, collected by XIAO Ning-nian and others.

Body length 610-750 µm.

Head oval, 80-83 µm in dorsal view. Anterior and posterior additional setae present; subposterior setae about 1.5 times the posterior setae in length;

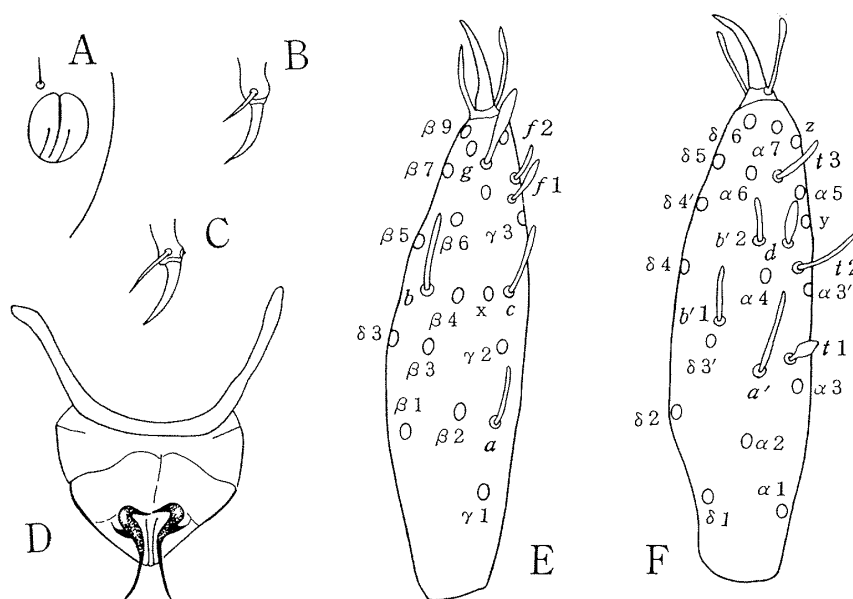


Fig. 4. *Pseudanisentomon cangshanense* sp. nov. A, Pseudoculus; B, middle claw; C, hind claw; D, female squama genitalis; E, foretarsus, exterior view; F, same, interior view.

anterior sensilla absent, but the posterior is present. Labral setae present; rostral setae a little shorter than the subrostral. Maxillary palpus with two sensillae, dorsal sensilla a little longer than the lateral. Pseudoculus circular, with distinct striae, one long middle and two short laterals (Fig. 4A), PR=8.

Tracheal camarae slender. Foretarsus (Fig. 4E–F) 55–57 μ m (51 μ m in matus junior), TR=5.5–5.6; empodium a little shorter than the claw; S-shaped seta subequal to the empodium in length. Dorsal sensilla *t1* close to $\alpha 3$, BS=0.9–1.0; *t2* thin; *t3* normal. Exterior sensilla *a* of medium size; *c* subequal to *b* in length; *d* short and broad; *e* absent; *f1* somewhat broad distally; *f2* short; *g* spatulate. Interior sensilla *a'* situated slightly proximal to *t1*, its apex not reaching the level of $\alpha 3'$; *b'1* a little longer than *b'2*; *c'* lacking. Middle and hind tarsi with long empodia about two-thirds of their claws in length, respectively (Fig. 4B–C).

Chaetotaxy as shown in Table 3. On thoraces II–III, dorsal P1a situated somewhat posterior to the row of P1 and 2, seta-like and a little shorter than P1, P2a on the same row as P2 and 3, less than two-thirds of P2 in length. Abdominal tergite II with five pairs of anterior setae; terg. III–VII with four pairs, A1, 2, 4 and 5; terg. IX–XI with four pairs of tergal setae; sternite VIII with two anterior and seven posterior setae; stern. IX–X each with two pairs of sternal setae, 1 and 2, without 1a. On terg. I, P1a situated slightly posterior to the row of P1 and 2, hair-like and about 1.4 times P1 in length, P3 and 4 sensilla-like and very short. On terg. II–VI, P1a and 2a situated somewhat posterior to the row of P1 and 2, hair-like and about 1.4 times P1 in length.

Table 3. Chaetotaxy of *Pseudanisentomon cangshanense* sp. nov.

		Dorsal		Ventral	
		Formula	Composition of setae	Formula	Composition of setae
Thorax	I	4		$\frac{6-2}{6}$	A1, 2, 3, M P1, 2, 3
	II	$\frac{6}{20}$	A2, 4, M P1, 1a, 2, 2a, 3, 3a, 4, 5, 5a, (5a')	$\frac{6-2}{6}$	A1, 2, 3, M P1, 2, 3
	III	$\frac{6}{18}$	A2, 4, M P1, 1a, 2, 2a, 3, 3a, 4, 5, 5a	$\frac{6-4}{8}$	A1, 2, 3, M1, 2 P1, 2, 3, 4
Abdomen	I	$\frac{4}{12}$	A1, 2 P1, 1a, 2, 2a, 3, 4	$\frac{4}{4}$	A1, 2 P1, 2
	II	$\frac{10}{16}$	A1, 2, 3, 4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{4}$	A1, 2, 3 P1, 2
	III	$\frac{8}{16}$	A1, 2, 4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{4}$	A1, 2, 3 P1, 2
	IV-VII	$\frac{8}{16}$	A1, 2, 4, 5 P1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{6}{10}$	A1, 2, 3 P1, 2, 2a, 2a', 3
	VIII	$\frac{6}{9}$	M2, 4, 5 Pc, 1a, 1a', 2, 2a	$\frac{2}{7}$	A Pc, 1, 1a, 2
	IX-X	8	1, 2, 3, 4	4	1, 2
	XI	8	1, 2, 3, 4	8	
	XII	9		12	

On terg. VII, P1a and 2a situated somewhat posterior to P1 and P2, P1a sensilla-like and very short, about one-third of P1 in length, but P2a hair-like and a little longer than P2. On terg. VIII, P1a' with basal dilatation, in normal position. Lateral stigmata II-IV distinct, with no reticulation. Lateral sclerotization on sternite VIII weak.

On female squama genitalis, caput processus shaped like duck's head, with oblique appendices, film processus relatively short (Fig. 4D).

Holotype. 1♀, Jizhaoan, 2,310 m alt., Diancang Shan Mts., Dali, Yunnan, 31-VIII-1993, collected by YIN Wen-ying and others.

Notes. The present new species is closely similar in many respects to *P. mokykos* from Guangdong, Gaungxi and Yunnan Provinces in China (ZHANG & YIN, 1984, and YIN 1985) and Hong Kong (IMADMTÉ & SO, 1992). It is, however, distinguished from the latter by the structure of pseudoculus and by the absence of foretarsal sensilla c'.

The specific name is derived from the Diancang Shan Mountains.

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